Improving Patient Safety with the Military Electronic Health Record

Marie-Jocelyne Charles, Bart J. Harmon, Pamela S. Jordan

Abstract

The United States Department of Defense (DoD) has transformed health care delivery in its use of information technology to automate patient data documentation, leading to improvements in patient safety. The Department uses an enterprise-wide medical and dental clinical information system that generates, maintains, and provides 24-hour secure online access to longitudinal health records.

CHCS II, the military's next generation of its Electronic Health Record (EHR), enhances patient safety for more than 9 million beneficiaries, with "one patient, one record." Because military families are highly mobile, the EHR makes the patient's medical history available at the point of care at any military medical facility in the world, thus greatly improving overall health care delivery and supporting patient safety initiatives for DoD beneficiaries. Currently, the military EHR supports 55,000 outpatient encounters each week. It provides a legible and longitudinal clinical record that includes drug interaction alerts, patient allergy notifications, and wellness reminders to enhance health care delivery.

Introduction

The United States Department of Defense (DoD) has taken a major step forward in the delivery of health care to its beneficiaries with the introduction of the Electronic Health Record (EHR), a detailed and automated accounting of each patient's medical history. For more than a decade, DoD has used one of the world's largest Computerized Provider Order Entry (CPOE) systems to capture important patient information for its more than 9 million beneficiaries. Patient data now can be shared worldwide, across the enterprise, in 70 hospitals, 411 medical clinics, and 417 dental clinics, as well as with forward-deployed medical units in the field.

Known as the Composite Health Care System (CHCS), the DoD's initial health record system has made the technological leap from paper to electronic order entry. Using CHCS, military medical providers can order laboratory tests, retrieve test results, authorize radiology procedures, prescribe medications, and schedule appointments—all electronically. Now the DoD is centralizing its patient records into a single global clinical data repository and extending its CPOE capabilities to achieve further gains in patient safety with the worldwide deployment of its EHR. "One patient, one record" is the philosophy that captures the importance of real-time, on-demand access to legible patient records. Building

Report Documentation Page		*Form Approved* *OMB No. 0704-0188*

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE **2005**	2. REPORT TYPE **N/A**	3. DATES COVERED **-**

4. TITLE AND SUBTITLE **Improving Patient Safety With the Military Electronic Health Record**	5a. CONTRACT NUMBER
	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Agency for Healthcare Research and Quality 540 Gaither Road, Suite 2000 Rockville, MD 20850**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT **Approved for public release, distribution unlimited**

13. SUPPLEMENTARY NOTES **Published in Advances in Patient Safety: From Research to Implementation. Volumes 1-4, AHRQ Publication Nos. 050021 (1-4). February 2005. Agency for Healthcare Research and Quality, Rockville, MD. http://www.ahrq.gov/qual/advances/**

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT **UU**	18. NUMBER OF PAGES **12**	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**			

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18

on experiences with CHCS, the DoD's robust EHR (CHCS II) technology increases efficiency and accessibility for improved clinical workflow, permits the tracking of health care metrics, and supports population health studies.

The DoD recognizes the value of secure, computerized patient records available on demand as a substantive tool for enhancing patient safety. The Institute of Medicine (IOM) and Agency for Healthcare Research and Quality (AHRQ) have conducted studies and published recommendations about how electronic records contribute to patient safety.[1, 2] Congress and the news media also have raised public awareness regarding the need to reduce preventable medical record errors.

So critical is the need for on-demand access to timely, reliable, and secure personal health information, that President George W. Bush addressed the subject in a radio broadcast to the nation a few days after his 2004 State of the Union Address, saying, "…[W]e can control health care costs and care by moving American medicine into the Information Age." Through actions such as adopting a "unified system of computerized records," the president continued, the U.S. health care system "would improve care, and help prevent dangerous medical errors, saving both lives and money."[3] By leading the way with innovative medical information technology solutions, DoD can set an example for other health care organizations eager to enter the information age and to meet the president's call to action.
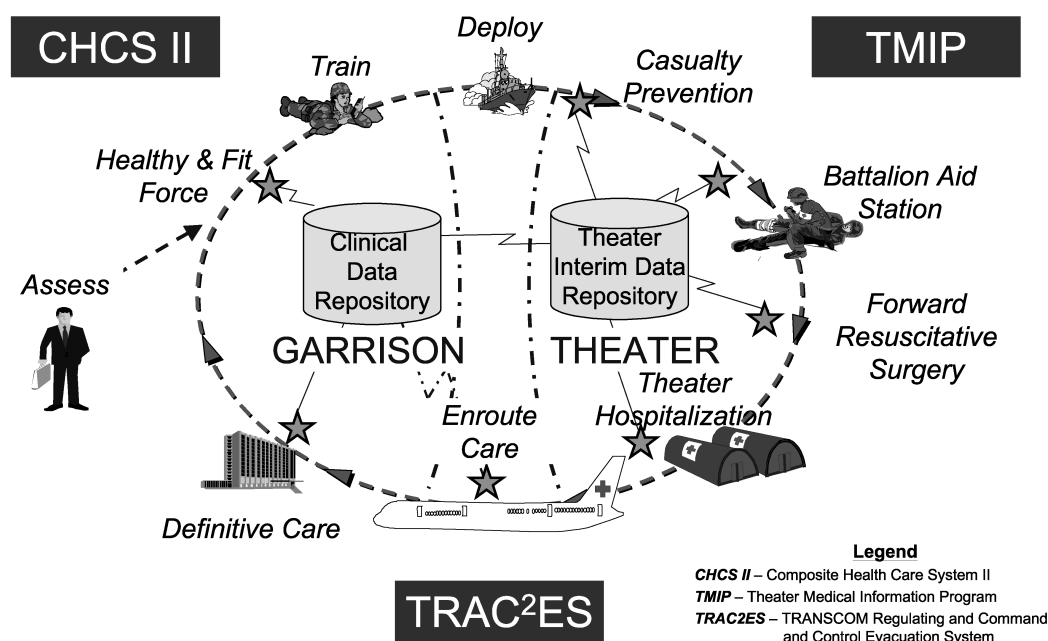
The DoD CPOE system permits physicians to record prescribed medications and view alerts for drug allergies or potential adverse interactions. A provider can access a patient's prescription history using CHCS to better identify and prevent drug interaction issues before they occur. In this way, CHCS and its linked pharmacy program have identified more than 131,000 potentially life-threatening drug interactions to date.

This chapter describes the EHR's core capabilities, its contributions to the patient safety realm, and some of the challenges of implementing a large-scale integrated clinical information system. In sharing some of the lessons learned, we hope that other health care organizations can build upon our successes as they implement standards-based EHRs to further enhance health care delivery and patient safety for all Americans.

The Military Health System

The Military Health System (MHS) enhances our nation's security by providing health support for the full range of military operations and sustains the health of all those entrusted to its care. From state-of-the-art hospitals and clinics, to battlefields and forward-deployed temporary medical facilities, MHS personnel worldwide dedicate themselves to supporting and delivering the best possible health care for America's Armed Forces, military retirees, and military families (Figure 1). In an average week, the MHS provides care to more than 19,000

Figure 1. Military Health Systems (MHS) integrating the Electronic Health Record (EHR)

Legend

CHCS II – Composite Health Care System II
TMIP – Theater Medical Information Program
TRAC2ES – TRANSCOM Regulating and Command and Control Evacuation System

inpatients and 1.7 million outpatients, issues 1.9 million prescriptions, and delivers about 2,000 babies.

During national emergencies, as part of global humanitarian missions—in peace and in war—military medical personnel treat injuries and illnesses, perform routine examinations, administer vaccines, deliver babies, and perform dental procedures. Additionally, they promote health awareness and education, identify and mitigate health threats, and ensure that America's Armed Forces are medically ready to meet any challenge.

MHS information management and technology systems

In his testimony before Congress, former Department of Health and Human Services (HHS) Secretary Tommy G. Thompson said, "Improvement in the safety, effectiveness, and efficiency of health care, and in public health preparedness, can be best achieved by the accelerated use of Health Information Technology (HIT)."[4] The MHS information technology systems enable doctors, nurses, technicians, and administrators to document patient care during military operations, and to establish, maintain, and access EHRs at any time. They also track medical supplies and equipment to assure that critical logistics systems respond to demand in real time. In addition, these systems monitor and improve overall health care delivery to patients, detect and analyze health trends from influenza to bioterrorism, as well as manage human and financial resources more efficiently.

Figure 2. Military Health Systems (MHS) information management/technology program
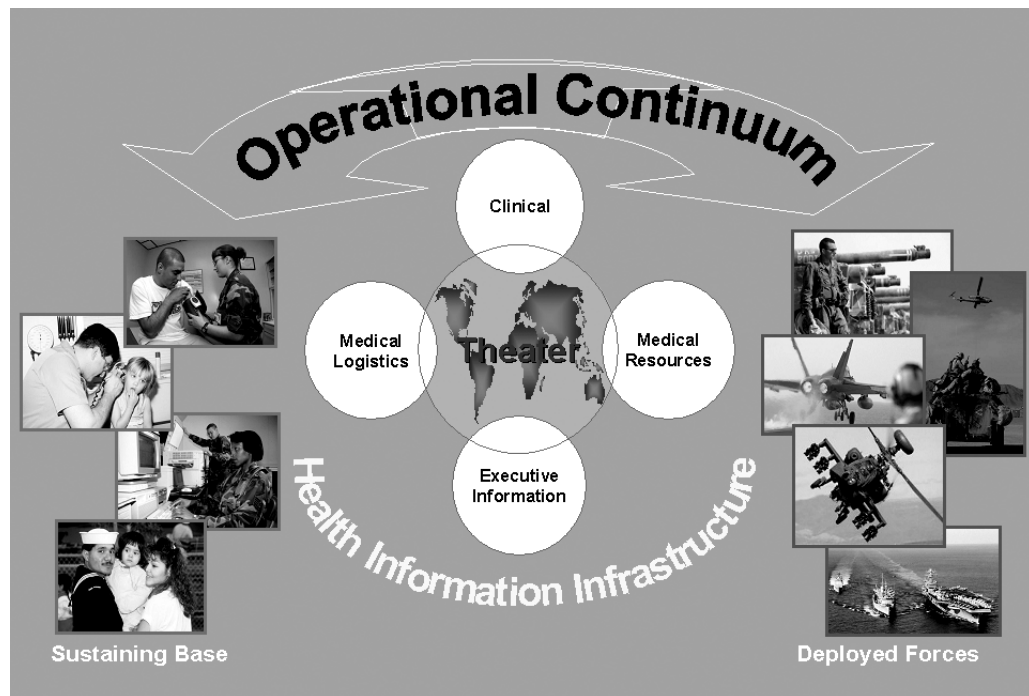
Computerized Provider Order Entry (CPOE) foundation

Before examining how the military EHR improves patient safety, we need to take a closer look at its foundation, an integrated clinical information system known as the Composite Health Care System, DoD's initial electronic health record. The MHS implemented CHCS in 1993, allowing health care providers worldwide to order laboratory tests, request radiology exams, issue prescriptions, and record diagnosis and treatment codes electronically.

Prior to CHCS implementation, military health care providers used standardized paper-based procedures to generate prescription orders, laboratory request forms, and referrals for radiology procedures. Enhancing patient safety was a primary goal of the military CPOE. This was accomplished by delivering legible data at the point of access to authorized users, while improving the availability and tracking of test results. It permitted third parties, radiologists, for example, to obtain clear and immediate consult orders. The CPOE system provides electronic documentation of 32 million appointments, 52 million prescriptions, 43 million lab tests, and 5 million radiology procedures annually. Moreover, CHCS has nearly eliminated the potential for misplaced laboratory or radiology orders, while also managing patient appointments electronically.

For more than 10 years, CHCS has issued alerts for potential adverse drug interactions and warnings about drug allergies. This safeguard feature was recognized in a study conducted by Gartner Research in 2002, which asserted that a CPOE "…must ensure that proposed orders are safe and do not entail excessive risks. …[It] should alert physicians to significant risks so that they do not

inadvertently overlook potential threats to patient safety—such as drug interactions."[5]

Additionally, an IOM report titled *The Computer-Based Patient Record (CPR): An Essential Technology for Health Care*, noted DoD's opportunity to build upon the successes of its CPOE. "CHCS is an excellent environment and opportunity to design, test, and evaluate certain desirable features of the ideal CPR system, and its potential in this regard may prove vital to accelerating the development of CPR systems generally."[6] CHCS continues to serve the MHS well, enabling improvements to health care delivery for beneficiaries and establishing a foundation for the next generation of its electronic health record system, CHCS II.

Electronic Health Record improves on CPOE

CHCS introduced military providers to the concepts of CPOE, as well as EHR storage, retrieval, and analysis. The MHS is now unveiling the next generation of its Electronic Health Record system, CHCS II. This system will enhance current clinical capabilities, including CPOE, and will centralize the military's EHRs. With CHS II, DoD moves to a patient-centric system that will enable military providers and other authorized users worldwide to access a single, longitudinal EHR for each beneficiary.

CHCS II is an enterprise-wide medical and dental clinical information system that provides secure online access to longitudinal health records, 24 hours a day. Because military service members and their families are a highly mobile patient population, the EHR makes a significant contribution to patient safety through its ability to make information available at the point of care. Additionally, CHCS II will:

- Create unified and detailed EHRs that include patient histories, allergies, alerts, laboratory and radiology results, diagnoses, treatments, and prescribed medications;

- Maximize use of enterprise-wide standardization procedures as it documents clinical patient encounters;

- Use physician documentation to code diagnoses and procedures automatically; and

- Better enable DoD to create, maintain, and make accessible one EHR for each patient worldwide.

CHCS II enables MHS providers to document the patient's health information and history, which then is consolidated in a single clinical database known as the Clinical Data Repository (CDR) and is made accessible to authorized users worldwide. The CDR facilitates trend analysis activities and medical surveillance at the patient or population level. For example, patient cholesterol levels can be easily charted over time, and compliance regarding periodic exams can be tracked and combined to produce population health reports for targeted groups. Providers can access executive-level reports on common diagnoses and procedures to identify trends of concern. CHCS II also incorporates all CPOE capabilities with a

user-friendly interface to improve coding practices and expand the documentation of medical care.

DoD initially deployed the next generation EHR to seven military facilities in early 2003. Following testing, the worldwide deployment of CHCS II began in early 2004. By early 2005, CHCS II was in use in about two dozen military treatment facilities, and providers were using the military EHR to support more than 55,000 outpatient encounters each week.

Core capabilities of military EHR improve patient safety

The MHS develops and enhances systems in an effort to support the best possible health care delivery and is continually improving the quality, safety, and continuity of care delivered to eligible beneficiaries worldwide. With CHCS II, the MHS identified and implemented additional functionalities intended to enhance patient safety. CHCS II meets widely accepted goals and standards for EHRs, such as the elements highlighted in IOM's 2003 letter report, *Key Capabilities of an Electronic Health Record System.* These core functionalities "promote greater safety, quality, and efficiency in health care delivery."[7]

Health information and data

The longitudinal, legible, and globally available health record data provides military EHR users with the information they need to make sound clinical patient care decisions. The CHCS II system captures essential data from the patient/ provider interaction in a clinically friendly and efficient manner. Data is gathered at each step of the health care visit as each member of the clinical team enters information into the system using various modules. This concept of one document shared by many contributors enables the capture of all information relevant to the clinical team's encounter with the patient, and is viewable and reusable. Personal information captured by CHCS II is protected using multiple layers of security. Authorized users are permitted to access only that level of information necessary to perform their roles in the delivery of care. Audit trails record the identity of any user who accesses or modifies any record or information stored in the system.

A patient encounter begins at check-in, when the medical technician checks and enters the patient's vital statistics into their EHR. A longitudinal record is immediately available, regardless of previous treatment locations, whether entered from desktop computers at other facilities or on laptops in deployed locations. Providers can immediately see past symptoms, diagnoses, allergies, and test results that may require followup. The physician then provides the necessary care and enters notes into the record. Since ordering and documentation are not two separate processes, the EHR initiates and documents the treatment plan, including radiology or laboratory tests, and any necessary prescriptions or referrals for followup visits. Finally, keywords from the encounter link automatically to the system's decision support tools. DoD leverages the power of computers to help military health care teams better treat patients, since the EHR mitigates risks associated with lost or incomplete paper records.

Results reporting and retrieval

Since test results (*e.g.*, radiology or laboratory findings) are managed electronically in the EHR, results are available sooner at the point of care to enable providers to initiate treatment sooner. The system automatically issues distinct displays of test results or abnormalities to providers.

Immediate access to key elements of the patient history permits easier comparisons and ensures that clinical staff will have the full range of information necessary at the time and place needed. Authorized providers participating in the care of a patient across multiple settings can simultaneously access new and previous test results almost instantly. Such data can be graphed within the system to provide a pictorial representation of status across time. These capabilities reduce clinical lag time and eliminate the need for test repeats, caused by missing documentation. This expediency increases efficiency and, in some cases, reduces the time needed to diagnose and treat medical conditions, further improving patient safety outcomes.

Order entry and management

CHCS II speeds the entry orders for laboratory, radiology, and pathology tests, as well as those for prescriptions. The system also issues reminders when tests or medication refills are due, further enhancing the efficiency of patient care. Such information is entered once, after which ordering occurs in real time. Order entry in a computer-based system eliminates legibility issues, while reducing duplication of effort, and all orders and changes are saved for future reference.

Decision support for prescriptions

The decision-support core function of CHCS II uses reminders, prompts, and alerts to assist physicians with diagnoses and treatments, while at the same time improving compliance with clinical best practices, periodic screenings such as mammograms, and other preventive practices.

Another major benefit of the EHR's decision support capability is its ability to identify possible drug interactions. Regardless of where a prescription is filled (e.g., military pharmacies, participating retail pharmacies, or national mail-order pharmacies), prescription information from the selected pharmacy is merged with the existing record. The patient's prescription history is viewed in real time and the system alerts providers to any potential adverse reactions before the medication can be ordered or dispensed. This capability augments patient safety and the quality of medical care by reducing the likelihood of adverse drug interactions, redundant prescriptions for the same condition, and the possibility of that the same drug might be obtained from multiple sources.

Electronic communication and connectivity

Efficient, secure, and readily accessible communication among providers improves the continuity of care and increases the timeliness of diagnoses and treatments. Such a communications link is critical, especially when managing

patients with chronic conditions, who are seen by multiple providers in multiple settings. A special version of the EHR for combat theater operations is available on laptops to document care rendered in the deployment environment. The collected data will eventually be transferred to the CDR. This further strengthens the "one patient, one record" approach and enables caregivers in isolated areas, such as Iraq and Afghanistan, to review a patient's history and update it with descriptions of the treatments and medications the patient is receiving.

Administrative processes

The military EHR stresses a team-based approach to health care, with streamlined and computerized business processes and appointment scheduling integrated into the system. These administrative tools greatly improve hospital and clinic efficiency, while reducing the workload ebb and flow, to better serve DoD patient needs in a more timely manner.

Reporting and tracking safety risks

Another major benefit of the military EHR is the highly structured and categorized health data it provides to support sophisticated data mining. Enhanced health care delivery for deployed troops is due in part to this technological innovation and its ability to recognize potential patient safety risks, such as influenza epidemics or biological weapon threats. The military EHR increases the efficiency with which uniform standards can be used to track diseases and fabricated threats, while sharing these trends with other organizational entities.

Standards are critical to consistency and the sharing of data between users, facilities, and systems. CHCS II complies with many of the system standards being adopted for use throughout the Federal Government. The importance of standards in EHR systems was further recognized in an IOM report, which stated, "Electronic data storage that employs uniform data standards will enable health care organizations to respond more quickly to federal, state, and private reporting requirements, including those that support patient safety and disease surveillance." [2, 7]

To better support health risk factor tracking and reporting, the DoD forwards nonindividually identifiable diagnoses to the Centers for Disease Control and Prevention (CDC) for study and analysis. The DoD forwards diagnosis and geographic information on 890,000 medical encounters in an average week, enhancing the CDC's ability to perform symptom surveillance in support of homeland defense. Moreover, the DoD is coordinating with the Department of Homeland Security to study the feasibility of using a laptop-based version of the EHR to support the treatment of civilians wounded in a mass casualty event. Such a deployment would enhance the ability of the Departments to document symptoms, diagnoses, and treatments in a consistent format, using a standard vocabulary. The collected data then could be assimilated into a data repository to better support analysis and patient tracking.

Keys to successful EHR implementation

Using standards to track and report patient safety risks is but one goal the military EHR has achieved to date. The MHS is collaborating with public and private organizations, in an effort to contribute to the success of the health care community at large, through shared knowledge, lessons learned, and challenges overcome along the way. The DoD leadership is willing to share what it has done in order to advance still larger gains in patient safety and quality care delivery.

Obtain provider support

DoD's enhanced EHR system was designed by health care providers for health care providers, involving providers in the design, development, and enhancement stages. This adoption process encourages user buy-in through demonstrations of how physicians and patients will benefit from such a system. A firm leadership commitment and endorsement of the system will further aid in its implementation. As the MHS demonstrated how CHCS could enhance health care delivery, reduce administrative time, and generate hospital-wide benefits, providers began to use the system more and more. Military providers now regard CHCS as an integral part of military medicine.

As CHCS II is deployed, the MHS will continue to address providers' concerns. The organization was involved from the onset of development and continues to be involved in identifying and prioritizing system enhancements. As a result, CHCS II now encompasses more than 400 user-suggested improvements.

Rigorous analysis of deployment-related requirements

An infrastructure assessment was used to determine adequacy and upgrades necessary for a worldwide system. Technical surveys identified requirements in support of system performance, such as response times for patient data retrieval, and status of server operations. In addition, functional surveys identified end user device requirements in order to properly allocate resources.

Phased implementation approach

The CHCS II system features are being implemented across several phases, to better accommodate the health care business model, to incorporate emerging enterprise and user requirements, and to permit the integration of new technologies. The phases with a focus on patient safety improvements are:

1. Outpatient clinical documentation (ambulatory care)
2. Dental documentation
3. Replacement of ancillary services (laboratory, pharmacy, radiology)
4. Inpatient documentation

The "start small and build on success" approach emphasizes the need to learn and rehearse the deployment process, gather valuable lessons learned, and perform root cause analysis. Doing so provides an invaluable opportunity to refine

processes and training, resolve technical or functionality issues, and assess productivity and workflow issues.

Customized training approaches

Role-based training is essential for privileged and non-privileged providers, such as physicians, registered nurses, physical therapists, nutritionists, medical technicians, support staff, and clerks. Lectures and classroom instruction are combined with "over the shoulder" assistance in the clinical work setting. Student-to-trainer ratios are determined largely by the number of trainers based at a facility. The MHS cultivated a group of "super users" who were adept at using the system, as a means of building an additional source of peer support. This "train the trainers" program has further established central sources of support and information, to expedite problem resolutions.

The training methodology takes into account the fact that regular workloads must be reduced to allow users time to attend training sessions, and to practice using the system's features in a clinical setting, before the system can be integrated into the workflow. Planning for reduced workflow impact creates opportunities for newly trained EHR users to become proficient with the system, which will return productivity to normal rates quickly.

Deployment support

CHCS II users receive continuous support through the Help Desk and Deployment Operations Center. These resources manage, coordinate, and integrate all activities necessary to deploy the EHR at DoD health care facilities. They also bring together key players in one centralized location and serve as a centralized clearinghouse for MHS facilities deployment support. The Deployment Operations Center further ensures prompt resolution of implementation issues and directs all day-to-day performance support meetings.

Data sharing initiatives and standards

With CHCS II, the DoD can share health care data between providers, facilities, and health care organizations, while maintaining full compliance with security and privacy protocols. When active duty service members retire, for example, their patient information is transferred to the Department of Veterans Affairs (VA), which then assumes the continuity of care from the point of military separation through the remainder of the service member's life. The DoD has been working with the VA to leverage the benefits of electronic health records through joint information exchange initiatives.

Underpinning many of the initiatives that support interagency sharing and interoperability is a health standards collaboration between the DoD and the VA. The Departments are currently evaluating the adoption of common standards in the areas of technical information, data, security, and communications, and are key participants in many national standards development efforts.

In addition, the DoD and the VA are lead partners in the Consolidated Health Informatics (CHI) project, one of the 24 electronic government (eGov) Internet-based technology initiatives supporting the president's management agenda. The goal of the CHI initiative is to establish Federal health information interoperability standards, to better facilitate electronic health data transfer across Federal health projects and activities. In March 2003, the HHS adopted the initial set of proposed standards, intended to address topics ranging from clinical laboratory results, health messaging, and prescription drug codes, to digital imaging, and medical device and computer connectivity. HHS adopted additional standards for other clinical domain topics in 2004. The exchange of appropriate health information will become easier in the years to come, as Federal entities come to agreements on common electronic information standards.

The CHI initiative to implement common health care information standards would achieve three important benefits. As Federal entities adopt and implement common standards, these should become an impetus for further standards adoption and use among the private sector. Lessons learned from projects involving the agreed-upon standards can provide valuable insight for future implementation of health care standards. Identifying and agreeing upon health data standards creates a strong foundation for the exchange of EHRs between entities—irrespective of whether they are public or private health care organizations.

Conclusion

The DoD and the VA are working to further broaden the realm of appropriate shared health care information as systems and data repositories mature, and standards and processes are further defined and implemented. Exchanging medical records between the military's CDR and the VA's Health Data Repository not only will improve the quality of health care delivered to the beneficiaries of both organizations, but will establish an industry model for interactive and exchangeable electronic health records.

As the military EHR is deployed to all land-based Army, Navy, and Air Force medical facilities—as well as those aboard ships and in battlefield encampments—the philosophy of "one patient, one record" will greatly improve patient safety as well as the delivered quality of health care. Moreover, the sharing of information and the larger lessons learned during the development and implementation of these systems are putting the DoD at the forefront of EHR advancement and facilitating patient safety and quality improvements across all settings of care.

An article titled, "Civil Sector Extols US Military Health System," appearing in *Jane's Defence Weekly*, cites Steve Lieber, the President and Chief Executive Officer of the Healthcare Information and Management Systems Society, who said the MHS is a standard that civilian medical providers should adopt.[8] Although the systems discussed here were designed specifically to support military medicine, many of these EHR initiatives could be leveraged for use by

other government and private health care organizations to achieve greater success and improve patient safety.

Acknowledgments

Author affiliations

TRICARE Management Activity, U.S. Department of Defense (Health Affairs), Falls Church, VA (MJC, PSJ, BJH).

Address correspondence to: Connie A. Gladding, Chief Enterprise Architect, Military Health System, Information Management, Technology & Reengineering Directorate, TRICARE Management Activity, U.S. Department of Defense (Health Affairs), 5111 Leesburg Pike, Suite 810, Falls Church, VA 22041; phone: 703-681-7731; e-mail: Connie.Gladding@tma.osd.mil.

References

1. Kohn LT, Corrigan JM, Donaldson MS, editors. To err is human: building a safer health system. A report of the Committee on Quality of Health Care in America. Institute of Medicine. Washington, DC: National Academy Press; 2000.

2. AHRQ's Patient Safety Initiative: Building foundations, reducing risk. Interim report to the Senate Committee on Appropriations. AHRQ Publication No. 04-RG005. Rockville, MD: Agency for Healthcare Research and Quality; 2003 Dec.

3. Bush, GW. The President's (Radio) Address to the Nation; January 24, 2004. Transcript available at: http://www.whitehouse.gov/news/releases/2004/01/20040124.html

4. Thompson TG. Statement before the U.S. House Labor /Health & Human Services/Education Appropriations Subcommittee; Washington, DC; 2004 Mar 4.

5. Hieb B, Handler T, Purchase E. How to gain value from physician order entry. Report No. R-16-9894. Stamford, CT: Gartner Research; 2002.

6. Dick RS, Steen EB, Detmer DE, editors. The computer-based patient record: an essential technology for health care, revised edition. A report of the Committee on Improving the Patient Record. Institute of Medicine. Washington, DC: National Academy Press; 1997.

7. Tang PC, Chair. Key capabilities of an electronic health record system. A report of the Committee on Data Standards for Patient Safety. Institute of Medicine. Washington, DC: National Academy Press; 2003.

8. Blank D. Civil sector extols U.S. military health system. Jane's Defence Weekly 2004;Mar(24):31.